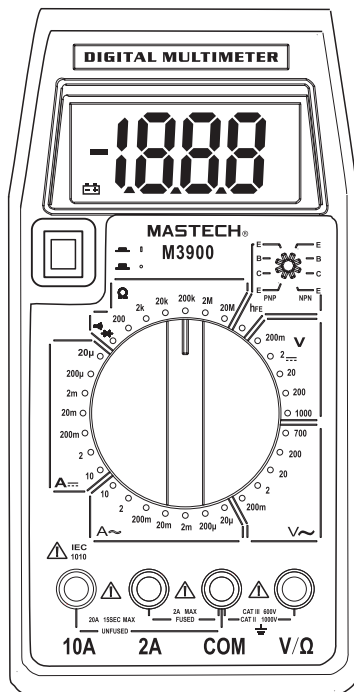


# MASTECH®

## M3900

### DIGITAL MULTIMETER



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## 1. SAFETY INFORMATION

This multimeter has been designed according to IEC-1010 concerning electronic measuring instruments with an overvoltage category ( CAT II) and pollution 2. Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

### 1.1 Preliminary








- When using this meter, the user must observe all normal safety rules concerning:
  - Protection against the dangers of electronic current.
  - Protection of the meter against misuse.
- Full compliance with safety standards can be guaranteed only if used with test leads supplied. If necessary, they must be replaced with the same model or same electronic ratings. Measuring leads must be in good condition.

### 1.2 During use

1. Never exceed the protection limit values indicated in specifications for each range of measurement.
2. When the meter is linked to measurement circuit, do not touch unused terminals.
3. When the value scale to be measured is unknown beforehand set the range selector at the highest position.
4. Before rotating the range selector to change functions, disconnect test leads from the circuit under test.
5. Never perform resistance measurements on live circuits.
6. Always be careful when working with voltage above 60V dc or 30V ac rms. Keep fingers behind the probe barriers while measuring.

8. Before attempting to insert transistors for testing, always be sure that test leads have been disconnected from any measurement circuits
9. Components should not be connected to the hFE socket when making voltage measurements with test leads

### 1.3 Symbols

	Important safety information, refer to the operating manual .
	Dangerous voltage may be present.
	Earth ground
	Double insulation(Protection class II).
	Fuse must be replaced with ratings specified in the manual.
	AC (Alternating Current)
	DC (Direct Current)

### 1.4 Maintenance

1. Before opening the meter, always disconnect test leads from all sources of electric current.
2. For continue protection against fire, replace fuse only with the specified voltage and current rating: F 2A/250V (quick acting).
3. If any faults or abnormalities are observed, the meter can not be used any more and it has to be checked out.
4. Never use the meter unless the back cover is in place and fastened fully.
5. Do not use abrasives or solvents on the meter, use a damp cloth and mild detergent only.

## 2. DESCRIPTION

This meter is a compact, rugged, battery operated, handheld 3 1/2 digit multimeter, capable of performing functions:

- DC and AC voltage measurement
- DC and AC current measurement
- Resistance measurement
- Diode measurement
- Audible continuity test
- Transistor hFE measurement

The Dual-slope A/D Convert uses CMOS technology for auto-Zeroing, polarity selection and overrange indication. Full overload protection and low battery indication are provided.

### 2.1 Power switch

A push - push switch is used to turn the meter on or off.

### 2.2 Display

3 1/2 digit, 7 segment, 18mm high LCD.

### 2.3 Function and range selector

There are different functions and 32 ranges provided . A rotary switch is used to select functions as well as ranges.

### 2.4 Input jacks

1. "COM" jack

Plug in connector for black (negative) test lead.

2. "V/Ω" jack

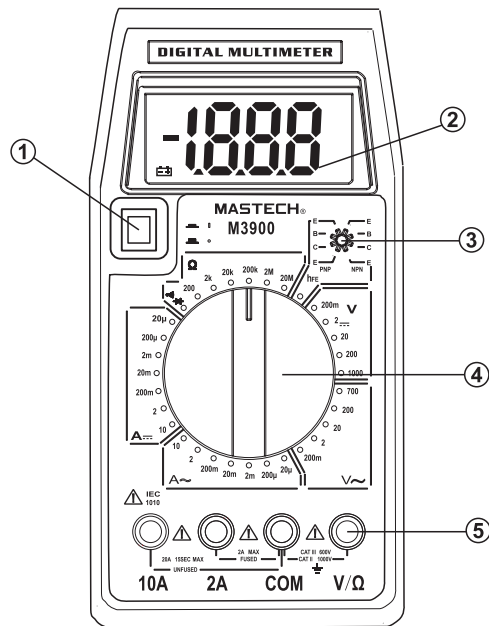
Plug in connector for red (positive) test lead for voltage and resistance.

3. "2A" jack

Plug in connector for red test lead for current (2A MAX).

4. "10A" jack

Plug in connector for red test lead for 10A measurement.



1. Power Switch
2. Display
3. Transistor Testing Socket
4. Rotary Switch
5. Input Jacks

## 3. OPERATING INSTRUCTION

### 3.1 Measuring voltage

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω jack.
2. Set the rotary switch at the desired  $V_{\text{DC}}$  or  $V_{\text{AC}}$  range position and connect test leads across the source or load under measurement. The polarity of the red lead connection will be indicated along with the voltage value when making DC voltage measurement.
3. When only the figure "1" is displayed, it indicates overrange situation and the higher range has to be selected.

### 3.2 Measuring current

1. Connect the black test lead to the COM jack and the red test lead to the A jack for a maximum of 2A current. For a maximum of 20A, move the red lead to the 10A jack.
2. Set the rotary switch at desired  $A_{\text{DC}}$  or  $A_{\text{AC}}$  range position and connect test leads in series with the load under measurement. The polarity of the red lead connection will be indicated along with the current value when making DC current measurement.
3. When only the figure "1" is displayed, it indicates overrange situation and the higher range has to be selected.

### 3.3 Measuring resistance

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω jack. (The polarity of red lead is "+")
2. Set the rotary switch at desired Ω position and connect test leads across the resistor under measurement.

#### NOTE:

1. If the resistance being measured exceeds the maximum value of the range selected or the input is not connected, an overrange indication "1" will be displayed.

2. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors have been discharged fully.
3. For measuring resistance above 1MΩ, the meter may take a few seconds to get stable reading. This is normal for high resistance measurements.

### 3.4 Testing diode

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω jack. (The polarity of red lead is "+").
2. Set the rotary switch at  $\rightarrow$  position and connect red lead to the anode, black lead to the cathode of the diode under testing. The meter will show the approx. Forward voltage of the diode. If the lead connection is reversed, only figure "1" is displayed.

### 3.5 Testing transistor

1. Set the rotary switch at hFE position.
2. Determine whether the transistor to be tested is NPN or PNP type and locate the Emitter, Base and Collector leads. Insert leads of the transistor into proper holes of the transistor testing socket.
3. The meter will show the approx. hFE value at test condition of base current 10μA and  $V_{ce}$  2.8V.

### 3.6 Continuity test

1. Connect the black test lead to the COM jack and the red test lead to the V/Ω jack. (The polarity of the red lead is positive "+").
2. Set the rotary switch at  $\text{f}$  position and connect test leads across two points of the circuit under testing. If continuity exists (i.e., resistance less than about 30Ω), built-in buzzer will sound.

## 4. SPECIFICATIONS

Accuracy is specified for a period one year after calibration and at 18°C to 28°C ( 64°F to 82°F) with relative humidity to 80% .

### 4.1 General

Maximum Voltage between Terminal and Earth Ground:	CAT II 1000V CAT III 600V
Fuse Protection:	A: F 2A/250V; 10A: unfused.
Power Supply:	9V battery, Neda 1604 or 6F22.
Display:	LCD, 1999 counts, updates 2-3/sec.
Measuring Method:	Dual-Slope integration A/D converter.
Overrange indication:	"1" figure only on the display.
Polarity indication:	"=" displayed for negative polarity.
Operating Temperature:	0°C to 40°C (32°F to 104°F)
Storage Temperature:	-10°C to 50°C (14°F to 122°F).
Temp for guaranteed accuracy	23°C±5°C.
Low Battery Indication:	" <del>---</del> " appears on the display.
Size ( H x W x L )	88W×172L×36Hmm.
Weight	370g ( including battery ).

## 4.2 DC voltage

Range	Resolution	Accuracy
200mV	100μV	±(0.5% of rdg+1 digits)
2V	1mV	
20V	10mV	
200V	100mV	
1000V	1V	

Input Impedance: 10MΩ on all ranges.

Overload Protection: 250Vrms AC for 200mV range, 1000V peak or 700Vrms AC for other ranges

## 4.3 AC voltage

Range	Resolution	Accuracy
200mV	100μV	±(1.2% of rdg+3 digits)
2V	1mV	±(0.8% of rdg+3 digits)
20V	10mV	
200V	100mV	
750V	1V	±(1.2% of rdg+3 digits)

Input Impedance: 10MΩ on all ranges.

Frequency Range: 40Hz to 1kHz; Indication: Average (rms of sine wave).

Overload Protection: 250 Vrms AC for 200mV range and 1000 VDC or 700Vrms AC for other ranges.

## 4.4 DC current

Range	Resolution	Accuracy
20μA	10nA	±(2.0% of rdg+5digits)
200μA	0.1μA	
2mA	1μA	±(0.8% of rdg+1digits)
20mA	10μA	
200mA	100μA	±(1.2% of rdg+1digits)
2A	1mA	
10A	10mA	

Max Input Current: 2A:2A. 10A:10A continuous, 20A 15 sec. MAX.(4 minutes maximum ON to measure 10 minutes OFF).

Overload Protection: 2A/250V fuse (10A range unfused);  
Measuring Voltage Drop:200mV

## 4.5 AC current

Range	Resolution	Accuracy
20μA	10nA	±(3.0% of rdg+7digits)
200μA	0.1μA	
2mA	1μA	±(1.0% of rdg+3digits)
20mA	10μA	
200mA	100μA	±(1.8% of rdg+3digits)
2A	1mA	
10A	10mA	

Max Input Current: 2A:2A. 10A:10A continuous, 20A 15 sec. MAX(4 minutes maximum ON to measure 10 minutes OFF).



Overload Protection: 2A/250V fuse (10A range unfused);  
Frequency Range: 40Hz to 1kHz.  
Indication: Average(rms of sine wave); Measuring Voltage Drop: 200mV.

## 4.6 Resistance

Range	Resolution	Accuracy
200Ω	0.1Ω	±(0.5% of rdg+3digits)
2KΩ	1Ω	
20KΩ	10Ω	±(0.5% of rdg+1digits)
200KΩ	100Ω	
2MΩ	1kΩ	
20MΩ	10kΩ	±(1.0% of rdg+2digits)

Overload Protection:250V dc/ac rms on all ranges.  
Open Circuit Voltage:Less than 700mV

## 4.7 Diode and Audible Continuity Test

Range	Description	Test Condition
	Display read approximate forward voltage of diode	Forward DC current approximately 1mA. Reversed DC voltage approximately 2.8V.
	Built-in buzzer sounds if resistance is less than approximately 30Ω	Open Circuit Voltage approximately 2.8V.

Overload Protection: Sounds alarm(250V dc/ac rms)


## 4.8 Transistor hFE Test

Range	Description	Test Condition
hFE	Display read approximate hFE value (0-1000) of transistor under test (ALL TYPE)	Base Current approx 10μAVCE approximately 2.8V.

## 5. ACCESSORIES

Test leads	Electric Rating 1500V, 10A MASTECH HYTL —095
Battery	9V NEDA 1604 or 6F22

## 6. BATTERY FUSE REPLACEMENT

If the sign “” appears on the LCD display, it indicates that battery should be replaced. Remove screws on the back cover and open the case. Replace the exhausted battery with a new one.

Fuse rarely need replacement and blow almost always as a result of the operator's error. Open the case and replace the blown fuse with the ratings specified: F 2A/250V (quick acting).

### Warning

**Before attempting to open the case, Always be sure that test leads have been disconnected from measurement circuits. Close case and tighten screws completely before using the meter to avoid electrical shock hazard.**

### CAUTION:

**Using this appliance in an environment with a strong radiated radio-frequency electromagnetic field (approximately 3V/m), may influence its measuring accuracy. The measuring result can be strongly deviating from the actual value.**

